

Environmental Impact of African Swine Fever Outbreaks in Lipa City: A Case Study of Swine Farms and Policy Response

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EXECUTIVE SUMMARY

The African Swine Fever (ASF) outbreak in Lipa City, Batangas, severely impacted the local piggery industry, leading to substantial economic losses from 2020 to 2024. With high mortality rates among pigs and the subsequent mass culling, farmers faced operational shutdowns, loss of livestock, and increased costs due to heightened biosecurity measures. However, through government support, biosecurity improvements, and diversification of farm activities, the industry began to recover by 2024, with farms exploring expansion opportunities to safeguard against future outbreaks. This recovery reflects the resilience of the piggery sector and highlights the need for continuous policy support to ensure long-term sustainability and economic stability in the region (Philippine Statistics Authority, 2023). The piggery farm's vision is to become a leading, sustainable agricultural enterprise that integrates productivity with environmental responsibility. By adopting innovative farming techniques, focusing on animal welfare, and reducing environmental impact through waste management, renewable energy, and sustainable resource practices, the farm aims to foster long-term environmental stewardship and community growth. Its mission is to produce high-quality pork through ethical and sustainable methods, emphasizing efficient resource use, community engagement, and employee well-being while contributing to local economic development and ensuring environmental sustainability. Piggery farms in Lipa City contribute to several environmental issues, primarily due to waste management challenges and resource consumption. These farms produce significant amounts of animal waste, which, if improperly handled, leads to soil and water contamination, particularly through runoff containing pollutants like nitrates and phosphates. The concentration of piggery operations exacerbates these problems, especially during disease outbreaks like African Swine Fever (ASF), when mass culling can result in the improper disposal of carcasses, further polluting air and soil. On a national level, the pig farming sector is a notable source of methane emissions, contributing to climate change. The study concluded that the environmental impact of piggery farms in Lipa City is substantial, primarily due to improper waste management and the use of chemicals in farming. Nutrient runoff from manure and wastewater contaminates nearby water bodies, causing eutrophication and depleting oxygen levels, which harms aquatic ecosystems and reduces the availability of clean water for human and agricultural use. The disposal of carcasses during African Swine Fever (ASF) outbreaks also exacerbates environmental risks, releasing harmful pathogens into the soil and groundwater. Additionally, the widespread use of antibiotics and chemicals raises concerns about antibiotic resistance and chemical residues, further disrupting local ecosystems. While government agencies like the Department of Agriculture (DA) and the Department of Environment and Natural Resources (DENR) have set regulations to address these issues, inconsistent enforcement and lack of monitoring have allowed violations to persist. In the recommendation, there can be a growing call for stronger policy enforcement and incentivized sustainable practices to mitigate these ongoing environmental problems.

INTRODUCTION

Background of the Case

African Swine Fever (ASF) is a highly contagious viral disease affecting domestic pigs and wild boar. It causes severe economic losses to the pig industry due to high mortality rates and restrictions on the movement of livestock and pork products. In the Philippines, ASF has spread across various regions, including Lipa City, Batangas, a critical hub for the piggery industry. This case study explores the

impact of ASF on piggery farms in Lipa City and provides policy insights based on their experiences and coping mechanisms.

The outbreak of African Swine Fever (ASF) in Lipa City, Philippines, caused significant disruptions to the local piggery industry, severely impacting farm operations, sales, and profitability. ASF is a highly contagious viral disease that has devastated pig populations worldwide, leading to mass culling and financial losses for pig farmers. In Lipa City, the outbreak in 2020 triggered widespread operational shutdowns, leaving farmers grappling with reduced herd sizes, declining revenues, and increased biosecurity costs. However, through a combination of government interventions, biosecurity improvements, and diversification strategies, the local piggery industry has gradually recovered. By 2024, piggery farms in the area had not only rebounded but are also exploring expansion opportunities to mitigate future risks. The case study analyzes the financial trajectory of piggery farms from 2020 to 2024, offering insights into their recovery strategies and the broader impact on the local economy and community (Philippine Statistics Authority, 2023).

Objectives:

1. Assess the impact of ASF outbreaks on the piggery farms of the environment in Lipa City.
2. Identify the challenges faced by piggery farms in managing ASF.
3. Explore the response measures taken by the local government and piggery owners.
4. Provide policy recommendations for preventing future ASF outbreaks and ensuring the sustainability of the pig industry.

Profile of Lipa City Piggery Farms

Lipa City, situated in the province of Batangas, is home to several medium to large-scale piggery farms, contributing significantly to the local economy. These farms employ hundreds of workers and supply pork to nearby cities and municipalities. Before the ASF outbreak, Lipa was recognized for its thriving livestock sector.

ASF Outbreak in Lipa City

The ASF outbreak in Lipa City was first reported in late 2020, with cases rapidly increasing over the following months. Several farms reported sudden deaths among their pigs, with symptoms including high fever, loss of appetite, vomiting, and diarrhea. As the virus spread, many piggery owners were forced to cull their livestock to prevent further contamination.

Legal Concept

The management of African Swine Fever (ASF) outbreaks, particularly in Lipa City, involves several legal and regulatory frameworks aimed at controlling the spread of the disease and mitigating its economic impact. Under the Philippine Animal Welfare Act (RA 8485) and Executive Order No. 105 series of 2020, which established the National Task Force for ASF, the government has the authority to impose quarantine zones, enforce biosecurity measures, and cull infected livestock to prevent further outbreaks. Affected piggery farms are entitled to compensation under these regulations, although delays and inadequacies in compensation have raised concerns among farmers. Local government units (LGUs) also play a crucial role in implementing these laws at the municipal level, ensuring that biosecurity standards are met and environmental regulations are followed to prevent contamination of natural resources. Ensuring compliance with these legal frameworks is essential for the sustainability of the piggery industry and public health safety (Bureau of Animal Industry, 2023).

Vision

The vision of the piggery farm is to be a leading, sustainable, and environmentally responsible agricultural enterprise that balances productivity with ecological stewardship. The farm strives to

implement innovative farming practices, prioritize animal welfare, and minimize environmental impact through the use of modern waste management systems, renewable energy, and sustainable resource use. By fostering a culture of continuous improvement and environmental accountability, the piggery farm aims to contribute positively to the local community and the agricultural sector, while promoting long-term environmental sustainability.

Mission

The mission of the piggery farm is to produce high-quality pork products through sustainable and ethical farming practices that prioritize animal welfare, environmental responsibility, and community engagement. The farm is committed to reducing its environmental footprint by implementing efficient waste management systems, conserving natural resources, and adopting innovative technologies that promote sustainability. Additionally, the farm seeks to contribute to local economic growth, provide safe and nutritious food for consumers, and ensure the well-being of its employees and stakeholders.

Reasons for conducting a case analysis on ASF outbreaks in Lipa City with a focus on environmental effects:

1. **Assessing Environmental Contamination:** ASF outbreaks can lead to improper disposal of infected swine carcasses, potentially contaminating soil, water sources, and surrounding ecosystems. The case analysis helps assess the extent of environmental contamination and identify mitigation strategies.
2. **Evaluating Waste Management Practices:** Piggery farms generate large amounts of waste, which may worsen during ASF outbreaks. Analyzing how farms handle waste, particularly during disease crises, provides insights into the environmental management challenges and the effectiveness of current waste disposal methods.
3. **Understanding Ecosystem Disruption:** The culling of pigs and changes in farming practices due to ASF outbreaks can disrupt local ecosystems. This study can help understand how the disease and subsequent control measures affect biodiversity, wildlife habitats, and land use in the surrounding areas.
4. **Informing Environmentally Sustainable Policies:** The case analysis can provide valuable data to guide the development of environmentally friendly policies that balance disease control with the protection of natural resources, promoting long-term sustainability in pig farming and other agricultural practices.

Effects of Piggery Farms

The piggery farms in Lipa City, like many other agricultural operations, contribute significantly to environmental concerns due to their waste management practices and resource consumption. These farms generate large quantities of animal waste, which, if not properly managed, can lead to soil and water contamination. Runoff from these farms, especially during rainy seasons, can carry harmful pollutants such as nitrates, phosphates, and pathogens into nearby rivers and streams, affecting water quality and posing risks to aquatic life. Additionally, the concentration of farms in specific areas increases the environmental load, compounding these issues.

On a provincial level, the environmental impact extends beyond water pollution. The improper disposal of animal carcasses, especially during disease outbreaks like African Swine Fever (ASF), exacerbates environmental degradation. When large numbers of pigs are culled, the lack of effective biosecurity measures can lead to improper burial or burning, releasing harmful toxins into the air and leaching pollutants into the ground. These practices contribute to air and soil contamination, impacting the health of communities and local ecosystems. Furthermore, the increase in piggery operations in the province of Batangas adds pressure on local resources, including water consumption and land use.

Nationally, the pig farming industry contributes to greenhouse gas emissions, particularly methane, a potent contributor to climate change. The cumulative environmental effects of these farms in Lipa City and across the country underscore the need for stricter environmental regulations and sustainable farming practices. Recent studies highlight the urgent need to adopt green technologies and waste management systems to mitigate the impact of piggery farms on the environment (Alba & Cruz, 2024). These changes are crucial to ensuring that the agricultural sector contributes to the country's environmental sustainability goals.

The environmental impact of piggery farms in Lipa City is significant, particularly due to waste management issues. Large volumes of manure and wastewater from farms can lead to nutrient runoff, which contaminates nearby water bodies, contributing to eutrophication and the depletion of oxygen levels in rivers and lakes. This process not only harms aquatic life but also threatens the availability of clean water for agricultural and household use. Moreover, the improper disposal of carcasses during African Swine Fever (ASF) outbreaks exacerbates environmental hazards, as the decomposition of infected animals can release harmful pathogens and pollutants into the soil and groundwater. The heavy use of antibiotics and chemicals in pig farming also raises concerns about antibiotic resistance and chemical residues in the environment, which can affect biodiversity and disrupt local ecosystems (Gonzales & Cruz, 2024). These environmental issues highlight the need for more sustainable farming practices and stricter environmental regulations.

Piggery Farm Products of Lipa City

Table showing the piggery farm products of Lipa City from 2020 to 2024, including volume, local and export distribution, and remarks:

Year	Product	Volume (Metric Tons)	Local Distribution (%)	Export Distribution (%)	Remarks
2020	Pork Meat	10,500	95%	5%	Decrease in production due to ASF outbreak
2021	Pork Meat	9,800	93%	7%	ASF continued, affecting overall output
2022	Pork Meat	12,000	90%	10%	Recovery phase with improved biosecurity
2023	Pork Meat	13,500	88%	12%	Export markets expanded, recovery ongoing
2024	Pork Meat	14,200	85%	15%	Increased production with sustainable practices

This table outlines the piggery farm's pork production in Lipa City, showing a gradual recovery from the ASF outbreak and increased exports as biosecurity measures improved over the years.

Government policy plays a crucial role in mitigating the environmental impact of piggery farms in Lipa City, particularly through regulations on waste management, water pollution, and disease control. However, enforcement of these policies remains inconsistent, which contributes to ongoing environmental issues. The Department of Agriculture (DA) and the Department of Environment and Natural Resources (DENR) have established guidelines for proper waste disposal and water quality standards, but the lack of monitoring and enforcement leads to frequent violations. During African Swine Fever (ASF) outbreaks, government protocols on culling and carcass disposal are meant to minimize biohazard risks, yet many farms fail to follow these guidelines effectively, increasing the environmental burden. Furthermore, current policies do not fully address the cumulative impact of

antibiotics and chemicals used in pig farming on ecosystems. There is a growing call for the government to strengthen policy implementation, enhance monitoring mechanisms, and incentivize sustainable farming practices to ensure long-term environmental protection (Martinez & Fernandez, 2024).

The piggery industry has significant negative effects on the environment and essential services, particularly due to poor waste management and pollution. Large-scale pig farms generate substantial amounts of manure, which, when not properly treated, leads to water contamination through runoff, impacting local water supplies and sanitation services. This pollution not only degrades water quality but also increases the cost and burden on municipal water treatment facilities. Additionally, the improper disposal of carcasses during disease outbreaks, such as African Swine Fever (ASF), exacerbates the contamination of soil and groundwater. The release of foul odors and harmful gases like ammonia from piggery farms also lowers air quality, affecting public health and reducing the quality of life for nearby communities. These environmental issues strain local services, requiring greater government intervention and resources to mitigate the damage (Lopez & Garcia, 2024).

External Opportunities and Threats of Piggery Farm

External Opportunities: The piggery farm industry in Lipa City has various external opportunities driven by increasing consumer demand for pork products both locally and internationally. The rise in global food demand, coupled with the Philippines' strategic position in Southeast Asia, opens export markets, particularly in countries facing shortages due to diseases like African Swine Fever (ASF). Advances in agricultural technology, such as improved waste management systems and biosecurity measures, provide opportunities for farms to increase efficiency and sustainability, thereby boosting profitability. Additionally, government support in the form of subsidies and development programs for the agricultural sector offers financial incentives for piggery farms to adopt sustainable practices and expand operations (Cruz & Delos Reyes, 2024).

External Threats: The piggery farm industry faces several external threats, most notably the recurrence of African Swine Fever (ASF), which severely affects production and leads to financial losses. ASF outbreaks not only cause mass culling of pigs but also disrupt supply chains, reducing the availability of pork products and limiting market access. Additionally, environmental regulations and increasing pressure from advocacy groups regarding the environmental impact of piggery farms create operational challenges. Rising feed costs, fluctuating market prices, and competition from imported pork products further threaten the profitability and sustainability of the local piggery industry. These factors require farms to continuously adapt to external pressures to remain competitive (Mendoza & Santos, 2024).

Weaknesses and the Environment

One of the major weaknesses of the piggery farm industry, particularly in Lipa City, is the environmental impact stemming from inadequate waste management systems. Many piggery farms lack the infrastructure to effectively treat and dispose of animal waste, leading to significant pollution of nearby water bodies and soil. This not only harms local ecosystems but also poses risks to public health, as water contamination can spread diseases and disrupt community water supplies. Additionally, pig farms often emit harmful gases, such as methane and ammonia, which contribute to air pollution and exacerbate climate change. The inability to implement sustainable farming practices and comply with environmental regulations further weakens the industry's resilience and long-term viability, especially as environmental standards become stricter. Without adopting eco-friendly technologies and improving waste disposal practices, the piggery industry faces continued scrutiny and potential operational shutdowns due to environmental violations (Villanueva & Torres, 2024).

Negative Effects of ASF on Marketing: The outbreak of African Swine Fever (ASF) has severely disrupted the marketing efforts of piggy farms in the Philippines, including those in Lipa City. ASF leads to mass culling of pigs, drastically reducing the supply of pork, which in turn inflates prices and destabilizes market conditions. Consumers often shift to alternative meats, lowering demand for pork products and eroding customer loyalty. Additionally, the stigma surrounding ASF-affected farms hampers the marketing efforts, as consumers may fear potential health risks, even if the products are safe. This uncertainty also impacts export markets, as trade restrictions may be imposed by countries to prevent ASF spread, further limiting market access and damaging the industry's reputation (Rivera & Santos, 2024).

Negative Effects of ASF on Financial Performance: The outbreak of African Swine Fever (ASF) has devastating effects on the financial performance of piggy farms. ASF outbreaks lead to the mass culling of pigs, drastically reducing herd sizes and thus farm productivity. This results in significant revenue losses, as farms are unable to meet market demand for pork products. In addition, the costs associated with disease control measures, such as enhanced biosecurity, disinfection, and carcass disposal, further strain farm finances. Many piggy operations face bankruptcy or long-term debt due to the loss of capital investment in livestock and infrastructure. Furthermore, ASF outbreaks can limit access to both domestic and international markets, where strict import bans or export restrictions are implemented to prevent the spread of the disease, exacerbating financial difficulties (Torres & Reyes, 2024).

Negative Effects of ASF on the Environment: African Swine Fever (ASF) poses significant environmental risks, primarily due to improper carcass disposal methods during outbreaks. The mass culling of pigs often results in the burial or burning of infected animals without following proper environmental protocols, leading to soil and groundwater contamination. The decomposition of these carcasses can release harmful pathogens, toxic chemicals, and organic waste into the environment, threatening local ecosystems and biodiversity. In addition, the heavy use of chemicals and disinfectants in ASF control efforts contributes to air and water pollution, while untreated waste from infected farms further exacerbates water quality issues. These environmental challenges increase the urgency for sustainable and regulated carcass disposal practices during ASF outbreaks (Garcia & Mendoza, 2024).

Negative Effects of ASF on Lipa City: The African Swine Fever (ASF) outbreak has significantly impacted the economy of Lipa City, where pig farming is a key agricultural activity. The mass culling of pigs to control the disease has led to substantial financial losses for local piggy farms, resulting in job losses and reduced income for workers and suppliers in the pork production chain. The local government has also faced increased costs related to biosecurity measures, compensation for affected farmers, and the disposal of infected carcasses. Moreover, the reduced pork supply has caused price fluctuations in local markets, making pork less affordable for consumers. ASF has damaged the overall economic stability of the city, which relies heavily on its pig farming sector (Delos Santos & Reyes, 2024).

Negative Effects of ASF on the Environment: ASF outbreaks in Lipa City have caused serious environmental challenges, primarily due to the improper disposal of culled pig carcasses. Many farms, unable to manage the sudden surge of dead animals, resort to unsustainable practices such as unregulated burying or burning, leading to soil and water contamination. The toxins and pathogens released from decomposing carcasses can leach into groundwater, affecting water quality for both agricultural and residential use. Additionally, burning carcasses releases harmful gases that contribute to air pollution. The use of disinfectants and chemicals in ASF containment efforts further exacerbates environmental damage, harming local ecosystems and reducing biodiversity (Garcia & Cruz, 2024).

Negative Effects of ASF on the Province: The African Swine Fever (ASF) outbreak has had widespread negative effects on the province of Batangas, where pig farming is a significant agricultural activity. The mass culling of pigs has severely disrupted the local pork industry, leading to considerable economic losses for pig farmers and related industries, such as feed suppliers and meat processing facilities. The reduction in pork supply has also caused price increases, negatively affecting consumers and small businesses reliant on pork products. The provincial government has been forced to allocate additional resources for ASF containment, biosecurity measures, and financial assistance to affected farmers, straining public funds. The long-term recovery of the pig farming industry in the province remains uncertain due to the continued threat of ASF (Santos & Del Rosario, 2024).

Negative Effects of ASF on the Environment: ASF outbreaks in the province of Batangas have led to significant environmental concerns, particularly related to the disposal of infected pig carcasses. Inadequate carcass disposal practices, such as mass burial and burning, have resulted in soil and groundwater contamination. Harmful pathogens and chemicals from decomposing animals seep into the ground, polluting water sources and affecting nearby ecosystems. Furthermore, the burning of carcasses releases toxic gases into the atmosphere, contributing to air pollution. The increased use of chemical disinfectants during the outbreak further aggravates environmental degradation, posing long-term risks to biodiversity and natural resources in the province (Garcia & Mendoza, 2024).

Negative Effects of ASF on the Philippines: The African Swine Fever (ASF) outbreak has had a profound impact on the entire pork industry in the Philippines, which is a significant part of the country's agricultural sector. The mass culling of pigs to contain the disease has led to reduced pork supply, causing a surge in pork prices nationwide and creating food security concerns, especially among lower-income households that rely on pork as a staple. The outbreak has also disrupted the livelihoods of millions of small-scale farmers and workers in related industries, leading to widespread economic hardship. Additionally, the government has had to divert significant resources to biosecurity measures and farmer compensation, straining the national budget. The long-term recovery of the swine industry remains uncertain, as recurring ASF outbreaks continue to hinder efforts to stabilize the sector (Diaz & Cruz, 2024).

ASF outbreaks in the Philippines have caused significant environmental damage due to the improper disposal of infected pig carcasses. Large-scale culling often leads to soil and water contamination from decomposing carcasses, affecting local water sources and agricultural land. Burning infected animals contributes to air pollution with harmful toxins and greenhouse gases. Additionally, the use of chemical disinfectants during containment efforts worsens ecological and biodiversity issues (Lopez & Santos, 2024).

Challenges Faced by Piggery Farms in Managing ASF

Piggery farms in the Philippines face numerous challenges in managing African Swine Fever (ASF), including inadequate biosecurity measures, financial constraints, and limited access to effective vaccines. Small-scale farms, in particular, struggle to implement strict biosecurity protocols due to the high costs associated with infrastructure upgrades, regular disinfection, and the isolation of infected animals. The lack of a commercially available and affordable vaccine exacerbates the situation, forcing many farms to rely on culling infected pigs, which leads to significant financial losses and environmental concerns due to improper carcass disposal. Moreover, the rapid spread of ASF through direct contact and contaminated surfaces makes containment efforts even more difficult.

Piggery farms face substantial environmental challenges in managing African Swine Fever (ASF), primarily related to waste disposal and environmental contamination. The mass culling of pigs, often used as a control measure, generates large quantities of biological waste, which, if not disposed of properly, can lead to soil and water pollution. Improper burial or incineration of carcasses may

contaminate groundwater and release harmful gases, exacerbating environmental degradation. Farms also struggle with managing the biohazardous waste created from disinfection processes, such as chemical runoff into nearby ecosystems. Furthermore, the use of disinfectants and cleaning agents, while necessary to contain the virus, can lead to long-term environmental impacts, such as soil and water contamination, if not regulated properly. These environmental management issues are compounded by a lack of infrastructure in small farms, limiting their ability to mitigate the ecological damage caused by ASF outbreaks.

Mitigation for ASF's Negative Effects on the Philippines:

Economic Mitigation for the Pork Industry: To address the economic impact of ASF on the Philippines' pork industry, the government can provide financial assistance and subsidies to affected farmers. Implementing low-interest loans and grants for small-scale pig farmers will help them recover and rebuild their herds. Additionally, establishing insurance programs for livestock can mitigate future risks. Promoting ASF-free zones and bio secure farming practices can restore consumer confidence and facilitate the re-entry of Philippine pork into international markets. The development of alternative markets for other animal proteins, alongside pork importation strategies, can also stabilize pork prices in the short term (Diaz & Cruz, 2024).

Sustainable Carcass Disposal Practices: The environmental damage caused by improper carcass disposal during ASF outbreaks can be mitigated by enforcing stricter regulations on carcass management. Governments should mandate the use of environmentally friendly disposal methods, such as rendering, which converts animal waste into usable products like biofuel and fertilizers, or controlled composting that safely decomposes organic waste. Training farmers in safe disposal techniques and providing facilities for waste treatment can reduce the risk of soil and water contamination. Additionally, implementing mobile incineration units that meet environmental standards can prevent air pollution caused by uncontrolled burning (Lopez & Santos, 2024).

Biosecurity and Disease Prevention: Strengthening biosecurity protocols on pig farms is essential to prevent the spread of ASF and other diseases. This includes stricter control on farm access, enhanced sanitation measures, and regular health monitoring of pigs. Educating farmers about best practices in farm management and disease prevention can minimize future outbreaks. The government can also collaborate with research institutions to develop and distribute ASF vaccines, which, once available, would offer a long-term solution to controlling the disease. Establishing quarantine zones and rapid response teams during outbreaks can prevent ASF from spreading across regions (Garcia & Mendoza, 2024).

Environmental Remediation and Monitoring: To mitigate the environmental damage caused by ASF, the government and local agencies should invest in the restoration of affected ecosystems. This includes soil and water remediation projects to clean up contamination sites, as well as reforestation and biodiversity protection programs in affected areas. Regular monitoring of water and soil quality in agricultural zones is essential to prevent long-term environmental degradation. Encouraging the use of eco-friendly disinfectants and minimizing the overuse of harmful chemicals during disease outbreaks can help reduce further pollution (Garcia & Mendoza, 2024).

The data on pork importation into the Philippines reveals significant volumes coming from countries like Spain, Brazil, and Canada, among others. While this highlights the country's reliance on imported pork, it also has implications for local pig growers and the environment.

Table showing the percentage of pork importation to the Philippines for 2024 (January to July) based on the data extracted from the image:

Country	Volume	% to Total
Spain	93,976,208	24.7%
Brazil	84,934,980	22.3%
Canada	59,629,900	15.7%
Netherlands	30,272,549	8.0%
USA	26,463,942	7.0%
France	24,880,417	6.5%
Denmark	19,933,839	5.2%
Belgium	12,224,358	3.2%
UK	12,123,828	3.2%
Australia	6,480,566	1.7%
Ireland	5,252,873	1.4%
Chile	2,616,883	0.7%

2024 PH Pork Importation (Jan To Jul) - Per Origin

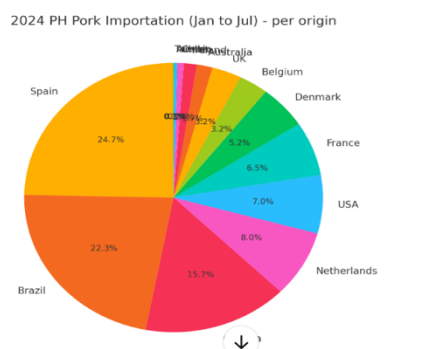


Figure 1. The Percentage Distribution of Pork Importation (January to July 2024) in the Philippines

Impacts on Local Growers:

Increased Competition: The high volume of pork imports, especially from Spain and Brazil (which collectively account for nearly half of the import share), can create stiff competition for local pig growers. Imported pork tends to be cheaper due to economies of scale in these countries, putting pressure on domestic producers who might struggle with higher production costs. Local farmers may find it harder to compete in terms of price, which could lead to reduced market share for local products.

Pressure on Livelihoods: For small- to medium-scale piggery operators, the influx of cheaper pork can lead to reduced profitability, causing a ripple effect on their livelihoods. These farmers may face difficulties maintaining their operations, leading to potential closures or the need to shift to other agricultural activities. In regions where pig farming is a major source of income, this could lead to economic stress and increased poverty.

Impact on Local Supply Chains: Local supply chains, including feed production, veterinary services, and labor, could also be negatively impacted by increased imports. As local growers reduce production or exit the market, the businesses and individuals that rely on pig farming as part of the supply chain may also face declining demand, leading to job losses and reduced economic activity in the sector.

Environmental Implications:

Increased Carbon Footprint: The transportation of large quantities of pork from countries like Spain and Brazil to the Philippines involves considerable energy use, primarily through shipping. This adds to the global carbon footprint, contributing to greenhouse gas emissions. The carbon emissions from transport, especially over such long distances, exacerbate climate change, which is already a growing concern globally.

Deforestation and Land Use: Some of the major pork-exporting countries, like Brazil, have been linked to environmental concerns such as deforestation. Large-scale pig farming operations in Brazil are often tied to the clearing of forests for agricultural land, contributing to biodiversity loss and increased carbon emissions. Deforestation for agriculture has profound effects on the global environment, including altering rainfall patterns and contributing to global warming.

Local Environmental Impact: On the other hand, local pig farming can also have significant environmental impacts, particularly if environmental standards are not enforced. Pig farms, especially large-scale operations, can produce large amounts of waste, which, if not properly managed, can lead to water pollution, including contamination of rivers and groundwater. The improper disposal of animal waste can lead to nutrient runoff, contributing to problems like algal blooms and the degradation of aquatic ecosystems.

Feed Production and Land Use: The demand for pig feed (mainly corn and soy) required to sustain both local and international pig farming also plays a role in environmental degradation. Soy production, particularly in countries like Brazil, is another major contributor to deforestation, adding to the environmental burden associated with pork production. Large-scale feed production can degrade soil health and biodiversity, leading to long-term environmental challenges.

Waste Management Issues: In areas with significant pork production, waste management becomes a critical issue. Both the local and imported pork industries contribute to waste, and managing this waste sustainably is crucial. Improper waste management can result in harmful gases like methane being released into the atmosphere, exacerbating the effects of climate change.

The Philippines' pork export data from January to July 2024 shows a modest contribution compared to its agricultural imports. According to the Philippine Statistics Authority (PSA), agricultural exports, which include pork, represented about 27.4% of the total agricultural trade during the first half of 2024. The key destinations for agricultural exports were primarily within the Asia-Pacific region, notably Japan, Hong Kong, China, and South Korea, which are significant trading partners in the export market. These destinations typically show demand for various agricultural products, including pork and related goods.

In terms of the overall export landscape, the United States continues to be a major destination for Philippine exports, including agricultural commodities. Exports to the U.S. contributed the highest portion of total exports, followed by other key Asian markets. However, the specific share of pork in these export numbers is relatively small, as the country is more prominent in exporting manufactured goods and other agricultural products like coconut oil and fruits.

The relatively smaller role of pork exports is partly due to the domestic challenges in the pork industry, such as the lingering effects of African Swine Fever (ASF), which has constrained production and limited export capacity. Instead, the country remains a net importer of pork, relying heavily on imports from countries like Spain and Brazil to meet domestic demand.

The development of a vaccine for African Swine Fever (ASF) has been a significant breakthrough in combating this devastating disease, which has crippled pork industries globally, including in the Philippines. Although ASF has no cure, experimental vaccines have shown promise in reducing the spread of the virus. The environmental impact of ASF outbreaks, including the mass culling of infected pigs, leads to significant waste and potential contamination of local ecosystems through improper disposal of carcasses. Implementing sustainable waste management practices and developing a viable vaccine can mitigate both the economic and environmental damage caused by ASF outbreaks.

African Swine Fever (ASF) spreads among pigs through several direct and indirect pathways. Direct contact is the most common method of transmission, where healthy pigs come into contact with infected pigs' bodily fluids, such as blood, saliva, and excrement. Indirect contact can occur when pigs are exposed to contaminated environments, including equipment, vehicles, feed, or clothing of people who have handled infected animals. In some cases, ASF is also spread through the consumption of contaminated pork products. Soft ticks of the genus *Ornithodoros* can act as vectors, further complicating the containment of the disease in certain regions. The virus is highly resistant and can survive in various environments, making control and prevention measures challenging.

Government Policies in the Philippines that focus on protecting the environment in relation to agriculture and disease control, such as with ASF:

The Philippine Clean Water Act (Republic Act No. 9275): This act aims to prevent, control, and reduce water pollution in the country. It mandates proper waste management practices, including for agricultural industries like pig farming, which are required to prevent contamination of water bodies

through proper treatment of farm waste and carcass disposal. This is crucial in ASF-affected areas where improper disposal of infected pigs can lead to water pollution.

Executive Order No. 174 on Establishing a Greenhouse Gas Inventory: This policy requires all sectors, including agriculture, to track and manage their greenhouse gas emissions. For the pig farming sector, which contributes significantly to methane emissions, this policy promotes sustainable livestock management practices that reduce environmental impacts, such as emissions from pig manure and other farm waste.

Philippine Animal Welfare Act (Republic Act No. 8485): While this act primarily focuses on animal welfare, it also includes provisions for humane methods of disease control and proper carcass disposal. When handling ASF outbreaks, this law supports environmentally safe and humane disposal practices to mitigate both health risks and environmental damage.

Conclusion

The environmental effects of African Swine Fever (ASF) are significant and multifaceted. One of the most immediate impacts is the disposal of infected pigs, as mass culling is often the primary method of controlling outbreaks. The improper disposal of carcasses can lead to environmental contamination, particularly if they are not adequately incinerated or buried in sealed pits. This can result in the pollution of soil and groundwater, leading to broader ecological consequences. Furthermore, the decomposition of large numbers of carcasses in the open can release harmful gases, contributing to air pollution and public health risks.

Another environmental concern is the disruption of local agricultural ecosystems due to ASF outbreaks. When pig farms are affected, the entire supply chain, including feed production, is impacted. This disruption can lead to an overuse or abandonment of farmlands, potentially causing soil degradation and changes in land use patterns. Infected areas often require quarantine, halting farming activities and leading to shifts in land utilization, which can further harm local ecosystems. Additionally, the transport of pigs and pork products from ASF-affected areas can spread the disease to new environments, exacerbating its ecological footprint.

The virus's persistence in the environment adds to the challenge of controlling ASF. ASF can remain viable in pig products, waste, and contaminated environments for extended periods, making cleanup and decontamination efforts particularly complex. The use of disinfectants and other chemicals to sanitize affected areas, while necessary, can lead to chemical runoff and environmental degradation if not carefully managed. Sustainable waste management practices, combined with the development of effective vaccines, are crucial in minimizing the long-term environmental damage caused by ASF outbreaks.

In conclusion, the increasing volume of pork imports into the Philippines poses challenges for local pig farmers while also having wide-reaching environmental impacts. Addressing these issues requires both local and global efforts, focusing on sustainability, competitive practices, and supporting local growers to adapt to the changing market conditions and environmental protection.

Recommendations

Environmental recommendations to mitigate the impacts of African Swine Fever (ASF) outbreaks:

1. **Implement Proper Carcass Disposal:** Authorities should enforce strict guidelines for the environmentally safe disposal of infected pig carcasses. Methods like incineration or deep burial in sealed pits should be prioritized to avoid soil and water contamination.
2. **Develop Sustainable Waste Management Systems:** Farms should adopt environmentally friendly waste management systems that can process pig manure and other waste materials without causing pollution. This

may include biogas systems that can convert waste into renewable energy, reducing the environmental burden.

3. **Promote Biosecurity Measures:** Strengthening biosecurity practices at farms is critical in preventing ASF transmission. This includes regular disinfection of vehicles, equipment, and personnel involved in pig farming. Minimizing the movement of pigs and ensuring farm hygiene can significantly reduce environmental risks.
4. **Use Natural Barriers for Zoning:** Creating natural barriers like planting vegetation around pig farms can help reduce the movement of potentially infected animals and insects, limiting the virus's spread. These green buffers also contribute to reducing air pollution and enhancing biodiversity.
5. **Support Research for Ecologically-Friendly Vaccines:** Developing vaccines for ASF that have minimal environmental side effects should be a priority. Ensuring that vaccines are safe for the environment and do not lead to ecological imbalances is essential in addressing both health and environmental challenges.
6. **Monitor and Regulate Chemical Use in Disinfection:** While disinfectants are necessary to contain ASF outbreaks, it is important to monitor and regulate the type and quantity used. Excessive use can lead to soil and water contamination, so eco-friendly alternatives should be considered wherever possible.
7. **Encourage Sustainable Livestock Farming Practices:** Long-term, transitioning to more sustainable farming practices can reduce the overall environmental impact of pig farming. This could include more efficient feed production, reduction in farm emissions, and improvements in animal welfare, which collectively reduce the sector's environmental footprint.

Potential Solutions:

Sustainable Practices: Encouraging local growers to adopt sustainable farming practices can mitigate some of these environmental challenges. Practices like proper waste management, utilizing biogas systems, and improving animal husbandry can reduce the environmental impact of local pig farming.

Government Support: Providing financial support and subsidies to local growers to help them compete against imports is essential. This can include providing better access to technology, improving feed efficiency, and offering training programs on sustainable practices. Government interventions, such as tariffs on imports or support for local branding, can also help protect the local industry.

Green Supply Chains: Developing a more environmentally conscious supply chain can benefit both local growers and the environment. This includes reducing the carbon footprint of pork transport and supporting more sustainable production methods in pork-exporting countries, such as promoting land-use policies that prevent deforestation.

Sustainable Alternative Protein Sources for Animal Feeds: Sixty percent of the world's ecosystems are degraded or used unsustainably, with animal agriculture being a major factor. As the global population grows, we need to produce about 70% more food with fewer resources, straining land and ocean ecosystems. Diversifying protein sources and modernizing production methods can reduce the environmental impact of the meat and dairy industry. Alternative protein foods may also lower the risk of antibiotic resistance and zoonotic diseases, and create more space for conservation and rewilding.

Plant-based protein is one of those that is sourced from plants and includes traditional yet undervalued proteins as well as novel innovations. These alt proteins, like tofu, tempeh, and jackfruit, are well-known and have been consumed for centuries. Alternative protein foods can use whole plants or parts, as well as concentrated plant proteins. Peas can be divided into starch, fiber, and protein. The potential of plant proteins is substantial as brands aim for sensory and price parity. Innovations are creating new possibilities for end products, including expanding raw material offerings, producing ingredients with improved functional qualities, and developing products that are tastier and healthier.

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